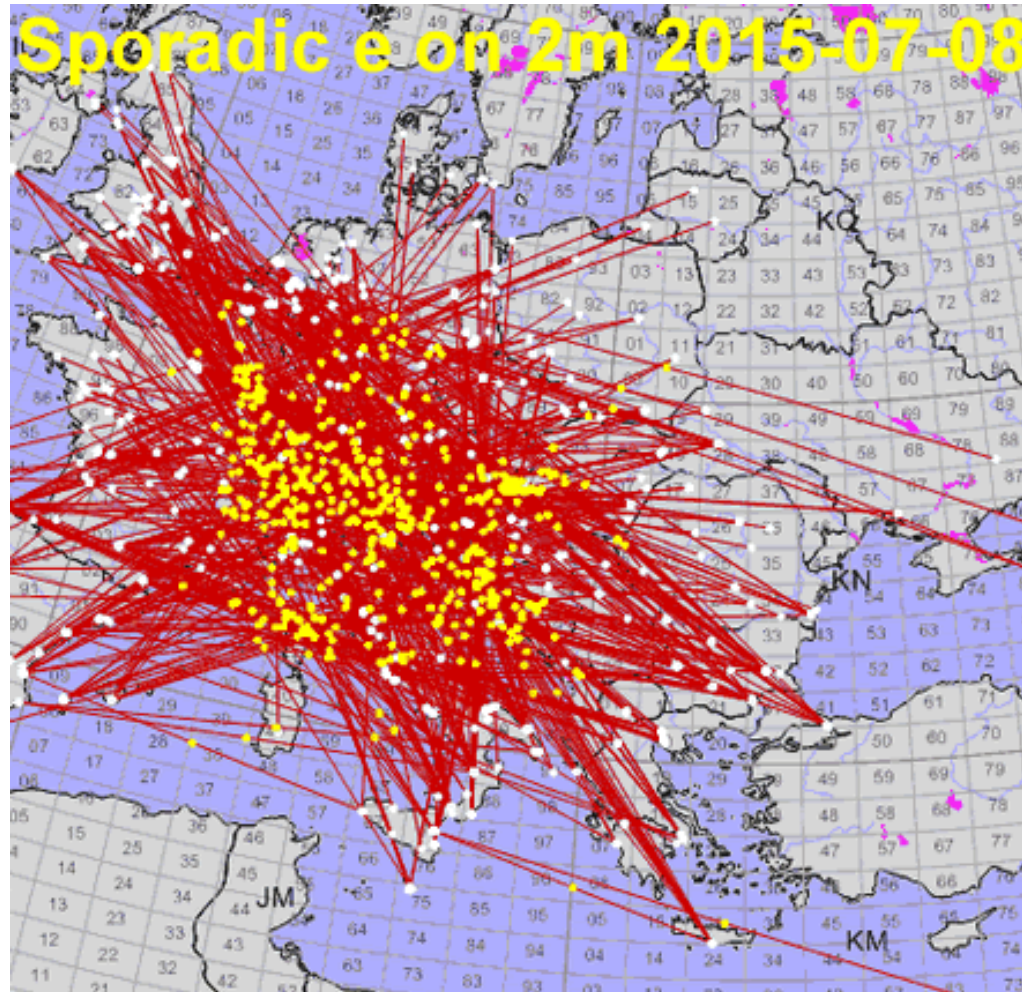


# Predicting Sporadic-E using Live MUF



# Live MUF – The application remit!

- Take cluster data and convert into usable information
- Produce a central repository for formatted propagation data
- Produce maps and graphs to enhance data interpretation
- Help me work more sporadic e on 2m otherwise I would MISS EVERYTHING!

# Hardware and software requirements

- Windows 98 v2 up or Linux Debian 4 up.
- Dot net 2 framework from either Microsoft or Mono
- Minimum tested - 200mmx cpu, 64mb memory and 800x600 256 colours graphics.
- Runs on SQLite, MySQL and SQL Server database applications.
- Internet access to connect to either a DX cluster node or to pull HTML cluster data from DX Summit, DXScape, FM List or G7RAU.

# LM – What does it do?

- Live propagation analysis inc. Sporadic e, F layer, field aligned, tropo and aurora. This helps to make short term predictions of possibilities.
- Propagation data available in the application as great circle maps and processed data analysis.  
Data stored for future analysis
- Astronomical mapping (circular and flat map)
- Mini logger application
- Manual tools for calculating es and F2 MUF, QRA, QRB and QTF.
- Cluster data import and export tools

# LM – What doesn't it do?

- Tell you in detail how the tool should be used
- Give you a pre-prepared layout, yes you have to do some work yourself!
- Tell you es predictions into the future (your brain needed to decide)
- Set limitations i.e. Aurora calculations can be set so extreme that the last thing you would be thinking about is the state of radio conditions as we all get frazzled! (but fun to model 😊)

# The Data

- Cluster data is the key to Live MUF existing at all with Spider DX cluster by Dirk Koopman – G1TLH at the heart of it, a marvellous tool
- Remember to use the DX cluster with the brain turned on.. Formatted spots help everybody and before you spot remind yourself of the ancient proverb “Crap in, crap out!”

# LM - Have a strategy

- Stack windows, don't maximise so you can get as much data on your screen as possible so at a glance you can get a feel for what is happening
- Use filters and colours wisely in DXC and maps so you can train your brain to instantly absorb the information.
- FM list and skimmer are great sources of data and can give you a heads up to rising MUF in the absence of standard DXC spots.

MUF @ 16.19MHz Live MUF calculator V7

File Windows Misc Zoom\*0.54 + Settings 12m up Tools Geo Object Help Exit

MUF @ 16.19MHz, try to KN60IV (qtf 99 / qrb 2826) FOT @ 16.2MHz (Below horizon.. chordal?) (13:11z)

Loq01 DX Eve GB7RAU-LOCAL ES data AU data VHF+ data HF data World world 6m ES MAP eu es V/U ALL sky QRA Calc AU MAP DXCC DATE MAP Analysis Call/Log wb1 Beacons Web DXC MUF Updates Spots Import

RAU Logger 01

Start Time... Finish Time...  
2015-09-13 02:26:03

Call sign... Op Name

RST> Nr< RST< Nr< Loc... ctest extra?

DXCC... Iu Cq Don't QSL? QSL Req?

IOTA... County... State...  
NONE NONE 1:NONE

Freq [CAT?] Prop... Mode? Mode 2?  
50.09499 ES A1A

Pwr Contest id? Operator  
80 1 2. G7RAU-I090IR87BS46

Rig 45: FT847+6el G0KSC

QSO OK? Manager? QSL Txed  
QSO to DXC QSL Rxed

Remarks

CQ? Next QSO? Clear? Quit?

Award type and values: X Band WAB  
NON NONE 0

DX Cluster Qaos Band Settings Log Search Contests DXCC Awards IO

DX de PY2VI:	28473.0	721SJ		
DX de DH2DAM:	28485.0	L08ECS		
DX de EA6ABR:	435849.0	IK0WGF	sorry the sat is	
DX de CE2AWW:	24899.0	IK5ZWD		
DX de PY2VI:	28466.0	4J3DJ		
DX de LZ2PT:	28025.6	721HL	CW	
DX de PR7RC:	28473.0	721SJ	SA PSE	
DX de PY2VI:	28470.0	A41KJ		
DX de PY2VI:	28490.0	2S5JY		
DX de PU1KDX:	28900.0	2S5JY	tnx 73 5/7	
DX de YT9A:	28087.9	3B9FR	nice signal	

G7RAU de GB7RAU 20-Sep-2016 13082 dxspider >

DX de PY3XK: 28473.0 721SJ NOW BEAMING TO SA E

DX de PY1FC: 28473.0 721SJ TNX QSO Suli,59+10

DX de PU1RSM: 28473.0 721SJ

DX de SK4AO: 144050.0 EU6AF on my CQ

DX de PR7RC: 28466.0 4J3DJ TNX Alex, see you i

DX de SV1KWX: 28479.6 VU2SCV TNX QSO 73

DX de DC8KU: 28121.1 LU7CAW psk31 tnx QSO Mark

DX de S59EHI: 28479.0 VU2SCV tnx

Live MUF DXC Talk, Personal and Chat Window

DXC

DX Call? Freq? DX Loc? Prop? RST / Info? Add Spot  
cfm [UNKNOW]

QRB QTF LP QTF

New Call New Dxc New Loc New Cnty New Iota New State

User Map (World)

VHF and Up Data

20 Sep  
PROPAGATION MODE ~ \*\*\*DIQ\*\*\* on (6m)  
FROM J010FJ TO IN3AH: QTF=205, QRB=856km  
FROM I090IR TO J010FJ: QTF=097, QRB=287km (F8GDP)  
FROM I090IR TO IN3AH: QTF=184, QRB=827km (EA3ARD)

13:05z [DX de EA6ABR: 435849.0 IK0WGF sorry the sat is F0-29 trnx]

20 Sep  
PROPAGATION MODE ~ \*\*\*SAT\*\*\* on (70cm)  
FROM JM19IO TO JN52VC: QTF=067, QRB=814km  
FROM I090IR TO JM19IO: QTF=164, QRB=1276km (EA6ABR)  
FROM I090IR TO JN52VC: QTF=129, QRB=1385km (IK0WGF)

13:09z [DX de SK4AO: 144050.0 EU6AF on my CQ] 20 Sep  
PROPAGATION MODE ~ \*\*\*TROPO\*\*\* on (2m)  
FROM JP70TO TO K035LA: QTF=128, QRB=915km  
FROM I090IR TO JP70TO: QTF=037, QRB=1520km (SK4AO)  
FROM I090IR TO K035LA: QTF=065, QRB=1945km (EU6AF)

Logger DXC Spot Watcher

Select watch bands Number in list? Data log No? Ignore Spotter?

ALL  50  01  Ignore Spotter?

LF  Ignore HF locs?  Only atn DXCC?

HF  12m up

Bnd	Call	Loc	n D	Spotter	Loc r	?
80m	E6GG		? !!!	EA1IFP		?
15m	D67GIA	? Y...	M0COM	L...	Y	
80m	E6GG	? !!!	W3LPL	F...	Y	
40m	JASCDL	PM64VF	Y...Y	UN7TK		?
17m	HB9CVQ	JN47KK	N...Y	RY3D		?
17m	T6EU		? Y...	EU2EU		?

MUF Data

12:45z [DX de A61KM: 28466.0 4J3DJ] 20 Sep  
es from LL74AA to LN30QK on 28.466. (QTF=343) (El=2) (QRB=1927km)  
Centre=LMS2MG Crf Freq=5.3MHz  
From I090IR try towards NJ00MX (QTF=95) (El=-20) (QRB=9385km)  
MUF=29.0MHz FOT=29.0MHz (Below horizon, multichordal?)

12:46z [DX de RA3RA: 28017.0 R2015M tnx QSO] 20 Sep  
es from L003VK to K047TT on 28.017. (QTF=285) (El=6) (QRB=1324km)  
Centre=K054WN Crf Freq=6.0MHz  
From I090IR try towards MN18UW (QTF=66) (El=-7) (QRB=4522km)  
MUF=32.7MHz FOT=32.7MHz (Below horizon...)

12:48z [DX de F1TRF: 24950.0 SV9RNG 73s... ] 20 Sep  
es from JN39CC to KM25JF on 24.950. (QTF=129) (El=1) (QRB=2163km)  
Centre=JN82GM Crf Freq=4.6MHz  
From I090IR try towards KM42VG (QTF=117) (El=-4) (QRB=3264km)  
MUF=25.0MHz FOT=25.0MHz (Below horizon...)

Aurora / Solar Data

FROM I090IR TO K047ES: QTF=056, QRB=2064km (RA1WU)  
FROM I090IR TO JP70NU: QTF=037, QRB=1520km (SK4MP)

12:47z [DX de RA1WU: 144050.0 SK4AO 55a 73 tu] 20 Sep  
PROPAGATION MODE ~ \*\*\*AU\*\*\* on (2m)  
FROM K047ES TO JP70TO: QTF=299, QRB=793km  
FROM I090IR TO K047ES: QTF=056, QRB=2064km (RA1WU)  
FROM I090IR TO JP70TO: QTF=037, QRB=1520km (SK4AO)

12:55z [DX de UA4NDX: 144050.0 UA4WFN lb6cck<AU>lb48to 57A] 20 Sep  
PROPAGATION MODE ~ \*\*\*AU\*\*\* on (2m)  
FROM L048TO TO L068CK: QTF=146, QRB=287km  
FROM I090IR TO L048TO: QTF=055, QRB=3310km (UA4NDX)  
FROM I090IR TO L068CK: QTF=058, QRB=3504km (UA4WFN)

WCY de DK0WCY-1 <13>: K=4 expK=3 A=15 R=61 SFI=106 SA=eru GMF=min AU=no  
2015-09-20

G7RAU's current set up for monitoring cluster data using Live MUF



# Sample methods

- Use Live MUF with multiple maps visible at once. The generic maps can all be configured for any mode and there are 99 of them to choose from.
- Use one map and change the minimum MUF as things improve.
- Both methods it is best to set up the map so that you only see your path across the centre points for the MUF range that you are interested in, i.e. If you are looking at 6m for an indication of possibilities of 4m paths for you then set the min MUF of your path to 70MHz.

# Multiple maps set to different frequencies and minimum MUFs

MUF @ 29.29MHz Live MUF calculator V7

File Windows Misc Connect Disconnect Settings Filters DXC Commands Alarms DDE Call Watch Pause Simulate OIRT VOR Help Exit

Sunday 20 September 2015 - 10:48z  
MUF @ 29.29MHz, try to KO55OK (qft 64 / qrb 2219) FOT @ 29.3MHz (10:47z)

GB7RAU 2m es 3m only 4m only 6m MUF 80 6m MUF 50 28 up World 10m up es ALL

DXC GB7RAU Connected

```
Date      Hour  SFI  A  K  Forecast  Logger
20-Sep-2015 09 106 16 7 Strong w/G3 R1 -> Strong w/G3 <AES>
+++++
Cluster: 377 nodes, 20 local / 4550 total users Max users 5048 Uptime 8 00:12
Please enter your name, set/name <your name>
Please enter your QTH, set/qrb <your qrb>
Please enter your location with set/location or set/qra
Please enter your Home Node, set/home/node <your home DX Cluster>
G7RAU-23 de GB7RAU 20-Sep-2015 1046Z dxspider >
DX de YU1FE: 14198.0 IH9/I79WKH af018 1057Z KN04
DX de UX4MX: 28460.0 EB3DYS tnx QSO dear Jordi 1046Z
DX de DL5JQ: 28046.4 OQ7A 1046Z JO31
DX de RD3QE: 21220.0 R2015SV 1046Z
DX de IK2A0H: 14205.0 GB75BB cq cq cq 1046Z JN45
DX de PB8DX: 21251.5 4LSLL 1047Z JO21
DX de PA3ECZ: 21220.0 R2015SV Danke für das QSO.... 1047Z JO33
DX de IK7UXW: 1296210.0 CM3KTR JN985I<TR>JN90XP 559 1047Z JN80
DX de OK2HB: 14205.0 GB75BB 1047Z JN99
DX de Z5SDCF: 21275.0 Z5SDCF BEAMING EUROPE 1047Z KG50
DX de L2ZTU: 21036.0 LA6TPA 1047Z
DX de EA7KJ: 7137.0 EA4FTV ECU-385 1047Z
DX de FIUM0: 21265.0 A61CK cq dx sir Mohammed 59+10 tnx 7 1048Z JO10
DX de UA0LOF: 21071.5 YD1FYD bpsk 31 1048Z PN53
```

DXCallsign? Freq? DXLoc? Prop? RST/Info? Add Spot  
cfm? UNKNOW

User Map (2m es)

User Map (3m only)

User Map (6m MUF 50)

User Map (6m MUF 80)

User Map (4m only)

EN 11:48





# Patterns and short term predicting the possibilities

- Look for progressive shortening of QRBs on 6m and 4m spots
- Look for centre-points clustered together, often an increased focus with a rising MUF a good sign.
- Look at movement of the centre-points and the geographical location as the MUF climbs, will it be in range in a few hours or maybe over the sea? You can set a map up purely to map centre-points and then use the multi-map tool to see the movement.
- Repetition, yes, es can reappear over the same areas for days at a time although often not reaching 2m in the first few days. Keep an eye out in the morning, afternoon, evening to the following morning, yes it can reoccur.

# July 8<sup>th</sup> 2015 05:00 – 22:59

- This shows how useful it can be to look at multiple maps at once to get a real feel on the way things are going and it helps to easily spot the patterns of a climbing MUF and a focused hotspot.
- [Live MUF screenshots movie by hour of multiple maps visible](#)

# Animations from July 8<sup>th</sup> 2015

- Further animations of a day's events to further demonstrate the tell-tail signs of a climbing MUF. Let's hope the projector can cope with Avi file or my tiff player 😊
- [All data 50MHz and up MUF >=50MHz 8/7/15](#)
- [All data 50MHz and up MUF >=65MHz 8/7/15](#)
- [All data 50MHz and up MUF >=50MHz 9/7/15](#)
- [All data 50MHz and up \(centres\) 9/7/15](#)
- [All data 50MHz and up \(centres\) 18/6/2013 – 20/6/2013](#)

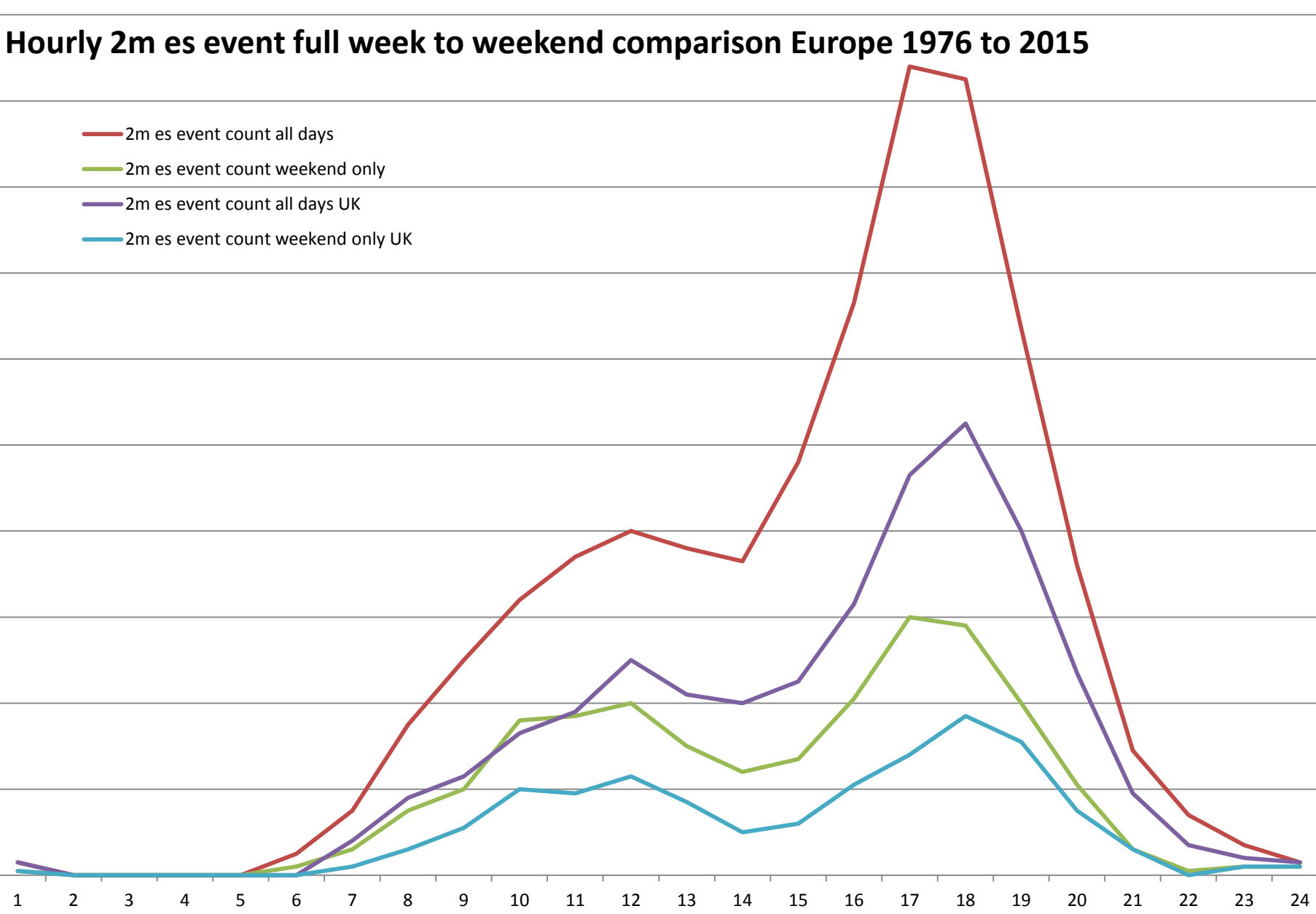
Data for 2015-07-08 available from [here](#) in spider format.

# Going forward

- What do users want?
- Where do I go from here?
- Live pattern and trend analysis?
- Should this now be a web application?
- Is C# and Mono/.net an acceptable platform?
- Access for all, so much can be done with time and resources (55.3 million sporadic e data records and 361.5 million DX spots / logbook data both spanning 20+ years).
- Currently 3300 known users of the application.
- Special thanks to G4FUF – Keith, G3NAQ – Geoff and many others for their contribution to the project.

# Hourly 2m es event full week to weekend comparison Europe 1976 to 2015

- 2m es event count all days
- 2m es event count weekend only
- 2m es event count all days UK
- 2m es event count weekend only UK

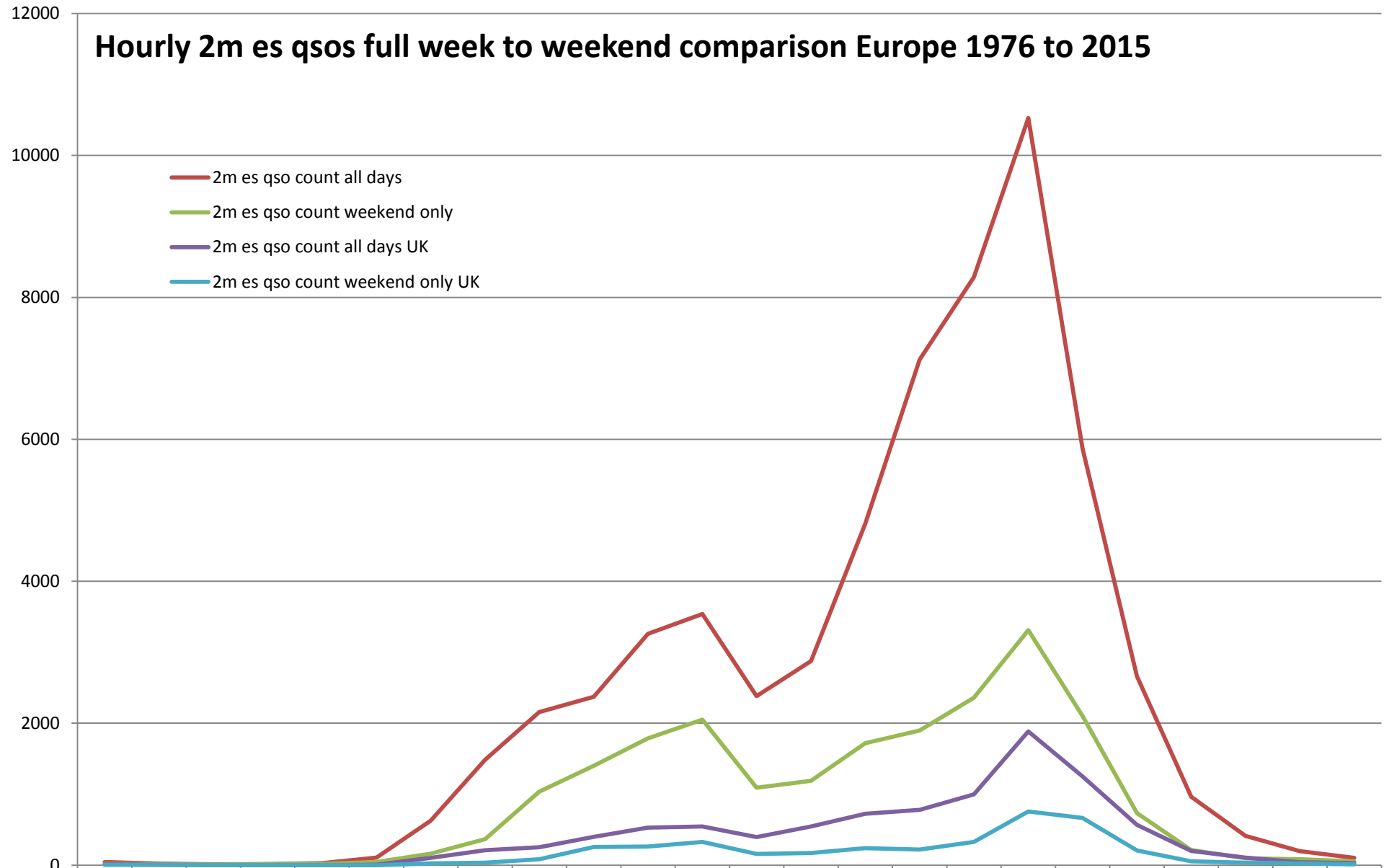




# Hourly 2m es qos full week to weekend comparison Europe 1976 to 2015

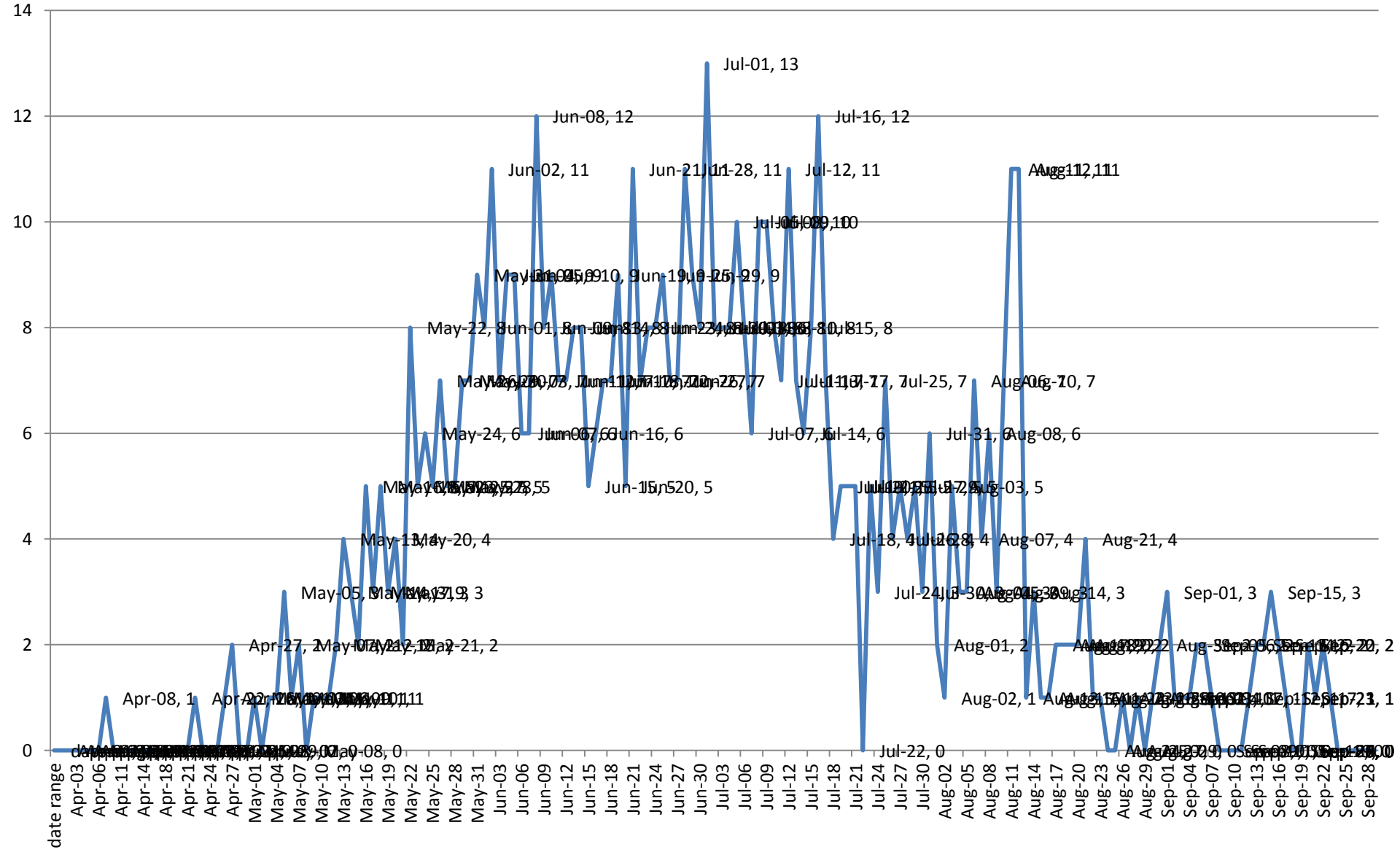
- 2m es qso count all days
- 2m es qso count weekend only
- 2m es qso count all days UK
- 2m es qso count weekend only UK

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24





# 2m es count of daily occurrences in Europe 1976 to 2015



**VHF spots**

Count UK call	Count NON UK call	Data year
59	107	1997
156	546	1998
171	1180	1999
230	2230	2000
269	2736	2001
243	2644	2002
274	2951	2003
246	2735	2004
302	3169	2005
385	4092	2006
371	4507	2007
352	4846	2008
491	6747	2009
604	8000	2010
499	7718	2011
547	7777	2012
591	8268	2013
553	8880	2014
613	8855	2015

**UK 2m es spots events**

Count call spots	Count days	Data year
2	37	1997
17	94	1998
17	94	1999
39	502	2000
43	407	2001
36	402	2002
59	579	2003
44	330	2004
74	649	2005
89	1078	2006
77	594	2007
36	159	2008
74	640	2009
92	505	2010
62	462	2011
46	297	2012
76	423	2013
20	32	2014
51	314	2015

**UK 2m es spots 2015**

Dx call	Count spots
G7RAU	63
G4SWX	40
GW7SMV	27
G4FUF	21
G4RRA	17
G4HGI	11
G4CLA	9
G4LOH	8
G0CUZ	7
GW8JLY	7
G6HKS	7
G0HVQ	6
G0LGS	6
G4KUX	6
GM8IEM	6
G4KVT	5
GM4FVM	5
2EONEY	5
G8HGN	4
GM3WOJ	4

Statistics produced from the processed DX Cluster data from Live MUF

The app available from

<http://g7rau.demon.co.uk>

or

<http://www.g7rau.co.uk>

It is important to read all the help files if you want to get the best out of it.

# Questions (image of all spots during the 3<sup>rd</sup> March 2015 aurora)

